



NPDES Permit No. NM0028355 Requested Information For Rapplication Rio Grande PCB Baseline

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2 attachments



Pages from PCBs_UppRioGrande_May12Armand.pdf Rio At Otowi Flow Data 08313000.2011.pdf

Isaac-

Per your request.

I have attached pages from a baseline study on PCBs in the upper Rio Grande (LA-UR-12-1081). On the last page is a summary table of total PCB concentrations. The highlighted data was collected at Otowi Bridge which is upstream of LANL. Also attached is the Water Data Report for 2011 for the same site (Otowi Bridge) which was downloaded from USGS. Flow data is presented for the site.

Please contact me if you have questions.

Thanks!

Marc Bailey



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TA59-96-208, MS K490
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LA-UR-12-1081
May 2012
EP2012-0047

Polychlorinated Biphenyls in Precipitation and Stormwater within the Upper Rio Grande Watershed

EXECUTIVE SUMMARY

This report presents baseline, base-flow, and storm-flow concentrations of polychlorinated biphenyls (PCBs) in certain surface waters located in the upper Rio Grande watershed and in areas in and around Los Alamos National Laboratory (LANL) as part of a cooperative investigation by the U.S. Department of Energy (DOE), the New Mexico Environment Department-DOE Oversight Bureau, and LANL.

The objectives of this study were to establish (1) baseline levels of PCB concentrations in precipitation and snowpack near Los Alamos, New Mexico, and from alpine peaks overlooking the northern Rio Grande watershed up to the state border with Colorado; (2) baseline levels of PCB concentrations in stormwater in northern New Mexico streams and arroyos that are tributaries to the Rio Grande and Rio Chama; (3) the range of PCB concentrations found in the Rio Grande during base-flow (dry weather flow) and storm-flow conditions; (4) baseline levels of PCBs in stormwater from undeveloped watersheds of the Pajarito Plateau and the northeast flank of the Jemez Mountains near Los Alamos; (5) the concentrations of PCBs in urban runoff from the Los Alamos townsite adjacent to LANL; and (6) how these findings may be used to target significant sources of PCBs.

PCB concentrations were measured using a high-precision analytical method (U.S. Environmental Protection Agency Method 1668A) that is capable of measuring concentrations as low as a few parts per quadrillion. The results were statistically reviewed to identify any anomalous contamination present at the sites. The concentrations were then compared with the New Mexico Water Quality Control Commission water-quality criteria (WQC) to gauge the magnitude of baseline PCB concentrations in surface waters. The WQC for total PCBs in water are 0.64 ng/L (0.64 ppt) for the protection of human health and 14 ng/L for the protection of wildlife habitat. The WQC for acute and chronic protection of aquatic life are 14 ng/L and 2 µg/L, respectively. With the exception of the chronic life criterion, which only applies under stable conditions, these criteria apply to all surface waters, whether base flow, storm flow, or storm runoff. Under base-flow conditions, results show the water column contained nearly universally low PCB concentrations in the Rio Grande, Rio Chama, and groundwater-fed tributaries. In contrast, surface waters during storm runoff generally contained PCB concentrations above 5 ng/L and substantially above the New Mexico WQC for protection of human health. Such concentrations were measured even in the most remote parts of the watershed and can be attributed to the increased concentrations of suspended soils and sediments carried by surface waters during storm runoff. Heightened PCB concentrations above 100 ng/L were measured in Los Alamos County urban runoff, presumably from the increase in diffuse sources in urban environments commonly reported in the scientific literature.

These findings will assist in identifying PCBs in surface waters originating from local industrial and urban sources versus global atmospheric deposition, thereby providing a context for future monitoring results used to determine environmental remedy priorities.

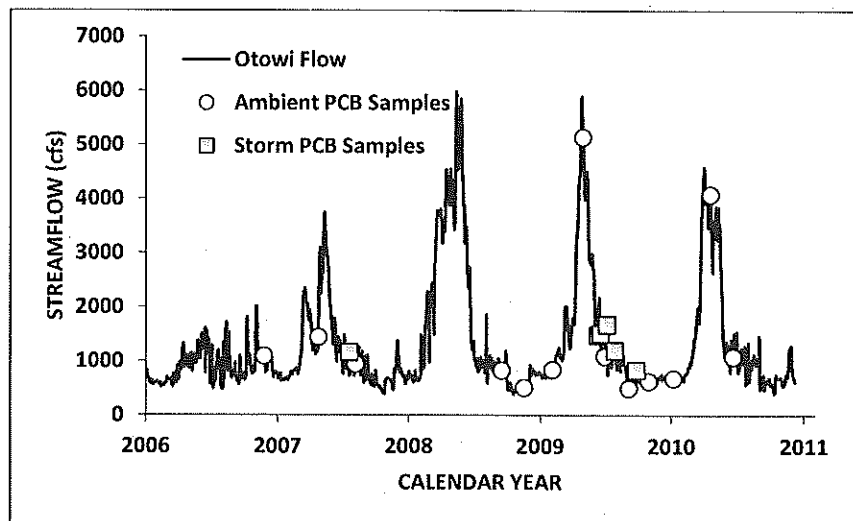


Figure 22 PCB sampling dates and stream flow for the Rio Grande at Otowi Bridge station.

4.4.1 Variation in PCB Concentrations in the Rio Grande and Rio Chama

Table 7 summarizes the total PCB concentrations and SSCs measured in samples collected from the northern Rio Grande and the Rio Chama. The overall median total PCB concentration for 68 samples collected above Cochiti Reservoir was 0.05 ng/L, which is substantially below the New Mexico human health WQC of 0.64 ng/L. Only 2 of 35 (6%) "Ambient" samples had total PCB concentrations above the human health WQC, and none were higher than the wildlife habitat WQC of 14 ng/L. For the "Storm" samples, 13 of 33 (39%) were above the human health WQC, and 3 of 33 (9%) were above the wildlife habitat WQC.

The greatest density of sampling was conducted at the Rio Grande at Otowi Bridge and Rio Grande at Buckman stations, located above and below LANL drainages, respectively. No significant difference in median total PCB concentrations between the Otowi and Buckman stations were evident for the "Ambient" samples (WMW Test, $p = 0.991$), for the "Storm" samples ($p = 0.47$), or for all samples combined ($p = 0.615$).

Suspended PCB concentrations (calculated) were included in Table 7 for storm samples with two or more results. Median concentrations ranged from 0.005 ng/g to 0.13 ng/g, bracketing the regional soil baseline median value of 0.02 ng/g. As with the water PCB concentrations, no significant difference in the median suspended PCB concentrations was evident at the Otowi and Buckman stations (WMW test, $p = 0.428$). The higher suspended PCB concentrations shown in Figure 22 at the Otowi and Buckman stations may reflect the occasional contribution of additional PCBs beyond global atmospheric deposition levels. The net effect on the Rio Grande, however, was not sufficient to bring about substantial changes in trends along the river.

Table 7
Summary of Total PCB Concentrations and
SSC Measured in Rio Grande and Rio Chama, 2006–2010

Station Name	Sample Type	Total PCBs (ng/L)			SSC (mg/L)			Suspended PCBs (Calculated) (ng/g)	
		N	Median	Max	N	Median	Max	N	Median
Rio Chama near Chamita	Ambient	4	0.05	0.14	2	1027	1390	—*	—
	Storm	3	0.10	0.11	2	993	1040	2	0.05
	Combined	7	0.06	0.14	4	993	1390	—	—
Rio Grande above NM-CO border	Ambient	1	0.10	0.10	1	4	4	—	—
Rio Grande at Lyden	Storm	3	0.01	7.09	2	1611	2816	2	0.005
Rio Grande below Rio Hondo	Ambient	1	0.76	0.76	1	12.2	12.2	—	—
Rio Grande below Taos Junction Bridge	Ambient	4	0.04	0.09	2	75.5	100	—	—
Rio Grande at Otowi Bridge	Ambient	14	0.02	1.36	12	63	2160	—	—
	Storm	10	0.24	50.0	7	1911	78870	7	0.13
	Combined	24	0.06	50.0	19	158	78870	—	—
Rio Grande at Buckman	Ambient	10	0.00	0.00	10	81.1	122	—	—
	Storm	17	0.55	51.4	11	1393	42100	11	0.06
	Combined	23	0.02	24.1	21	533.7	42100	—	—
Rio Grande below Ancho Canyon	Ambient	1	0.03	0.03	1	104	104	—	—

* — = Ambient suspended PCB concentrations not calculated because ambient samples typically did not contain appreciable amounts of suspended sediment.

Total PCB concentrations were strongly correlated (Pearson $R^2 = 0.73$; $p < 0.00001$) to SSCs in the storm samples, as shown in Figure 23. No apparent correlation was evident in the base-flow samples, however, probably because the overall SSC is low and PCBs are detected at a lower frequency in that group of ambient samples.

The Rio Grande PCB sampling stations were located along an approximately 100-mi segment that extends into Colorado. The sample results within the upper part of the segment were too few to allow for a formal analysis of longitudinal concentration trends. However, a visual comparison of concentrations is presented in Figures 24 to 26. For each Rio Grande station, the raw results and station median are plotted for both water samples and calculated suspended PCB concentrations in the samples. No significant longitudinal pattern trends are apparent, and median concentrations are relatively consistent upstream to downstream.

4.4.2 Fingerprint of PCBs in Northern Rio Grande and Rio Chama

The upper Rio Grande and Rio Chama drainage systems encompass large geographic areas, with landscapes varying from desert grasslands to verdant alpine ecosystems. The PCB fingerprints in the rivers potentially may vary widely within such diverse settings. Not only do the PCB fingerprints of precipitation vary, so do those of native soil. Coupled with these factors are the various sources of surface water that feed the rivers. During the late spring, flows in these rivers are dominated by melting snow near the New Mexico–Colorado border. Thunderstorm runoff may be locally plentiful during the summer and early autumn, while flows in intervening periods are heavily influenced by discharge of regional groundwater via springs and seeps.

Water-Data Report 2011

08313000 RIO GRANDE AT OTOWI BRIDGE, NEAR SAN ILDEFONSO, NM

Upper Rio Grande Basin
Upper Rio Grande Subbasin

LOCATION.--Lat 35°52'28.2", long 106°08'32.8" referenced to North American Datum of 1983, Santa Fe County, NM, Hydrologic Unit 13020101, on San Ildefonso Pueblo Grant, near right bank on downstream end of pier of former railway bridge, 400 ft downstream from bridge on State Highway 502, 1.8 mi southwest of San Ildefonso Pueblo, 2.5 mi downstream from Pojoaque River, 6.8 mi west of Pojoaque, and at mile 1,614.2.

DRAINAGE AREA.--14,300 mi² of which 2,940 mi² probably is noncontributing, from the closed basin in San Luis Valley, Colorado.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--February 1895 to December 1905, June 1909 to current year. Monthly discharge only for some periods, published in WSP 1312. In early reports this record was published as "at Water Tank," as "at Rio Grande," and as "near Buckman."

REVISED RECORDS.--WSP 828: drainage area. WSP 1512: 1895-99, 1904-06, 1911-12, 1914, 1931(M), 1935. WSP 1712: 1904(M). WDR-NM-90: 1989.

GAGE.--Water-stage recorder with satellite telemetry. Datum of gage is 5,488.48 ft above NGVD of 1929. See WSP 1312, 1732, or 1923 for history of changes prior to June 1, 1910.

REMARKS.--Records fair except for estimated daily discharges, which are poor. Considerable regulation by Heron Reservoir (station 08284510), El Vado Reservoir (station 08285000), and Abiquiu Reservoir (station 08286900) on Rio Chama, which can contribute a major portion of the total flow. Flow affected by release of transmountain water from Heron Reservoir since May 1971. Diversions upstream from station for irrigation of about 620,000 acres in Colorado and 75,000 acres in New Mexico.

EXTREMES OUTSIDE PERIOD OF RECORD.--The 1920 flood is greatest since at least 1884 and probably since 1741; information from file of W.H. Yeo on floods.

08313000 RIO GRANDE AT OTOWI BRIDGE, NEAR SAN ILDEFONSO, NM—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	555	442	558	473	652	819	693	1,140	1,820	1,320	970	654
2	668	425	562	348	e600	815	752	1,210	1,880	1,400	880	784
3	696	414	583	467	e490	819	821	1,210	1,770	1,400	878	733
4	738	407	640	615	e520	811	858	1,200	1,870	1,260	873	736
5	518	429	681	639	663	819	879	1,100	1,890	1,040	886	753
6	478	580	706	666	653	821	820	1,090	1,990	934	875	578
7	483	702	744	669	618	835	1,010	1,100	1,880	997	971	554
8	507	740	752	675	617	829	1,060	1,160	1,980	1,230	972	631
9	612	745	710	695	608	802	995	1,220	2,160	1,310	944	697
10	596	728	711	703	588	807	971	1,060	2,290	1,300	998	862
11	590	693	812	683	595	810	870	1,100	1,950	1,280	1,030	763
12	647	694	836	690	629	801	844	1,280	1,680	1,250	1,140	701
13	617	693	838	703	634	797	800	1,190	1,450	1,180	1,260	620
14	607	692	1,130	706	639	805	782	1,270	1,370	1,130	1,240	579
15	632	688	1,180	681	641	815	792	1,250	1,270	1,220	1,110	544
16	634	688	1,210	652	e680	823	807	1,240	1,220	1,230	992	590
17	620	680	1,250	659	e705	824	842	1,240	1,170	1,110	878	536
18	618	690	1,230	682	e725	825	984	1,230	1,280	972	862	481
19	679	685	1,120	687	749	856	1,110	1,350	1,430	1,060	854	459
20	682	693	1,150	687	773	881	1,120	1,400	1,380	1,120	943	425
21	685	700	1,280	680	797	915	1,160	1,370	1,400	1,120	1,270	488
22	607	702	958	669	792	934	1,050	1,280	1,410	1,160	817	525
23	554	689	835	686	795	930	1,330	1,210	1,340	1,160	527	502
24	557	671	786	671	791	907	1,270	1,150	1,230	1,150	436	469
25	568	676	737	663	814	891	1,280	1,240	1,140	1,140	468	459
26	575	625	715	653	811	860	1,140	1,250	1,080	989	656	451
27	560	547	711	644	810	824	1,100	1,380	1,140	935	621	460
28	559	564	693	661	838	804	1,040	1,510	1,440	887	608	501
29	569	589	660	644	---	780	990	1,530	1,470	944	778	481
30	582	588	644	637	---	785	1,120	1,520	1,450	1,070	553	466
31	508	---	618	641	---	719	---	1,520	---	1,040	569	---
Total	18,501	18,859	26,040	20,029	19,227	25,763	29,290	39,000	46,830	35,338	26,859	17,482
Mean	597	629	840	646	687	831	976	1,258	1,561	1,140	866	583
Max	738	745	1,280	706	838	934	1,330	1,530	2,290	1,400	1,270	862
Min	478	407	558	348	490	719	693	1,060	1,080	887	436	425
Ac-ft	36,700	37,410	51,650	39,730	38,140	51,100	58,100	77,360	92,890	70,090	53,270	34,680

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1971 - 2011, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	773	896	877	771	874	1,308	2,141	3,465	2,958	1,456	987	873
Max	2,225	2,034	1,959	1,757	2,641	3,127	6,412	8,390	7,914	4,548	2,132	1,553
(WY)	(1998)	(1987)	(1976)	(1986)	(1987)	(1987)	(1985)	(1985)	(1979)	(1995)	(1999)	(1999)
Min	361	368	426	436	498	610	489	433	470	394	391	263
(WY)	(1975)	(2003)	(2003)	(1977)	(2003)	(2003)	(1977)	(1972)	(1972)	(1972)	(1972)	(1974)

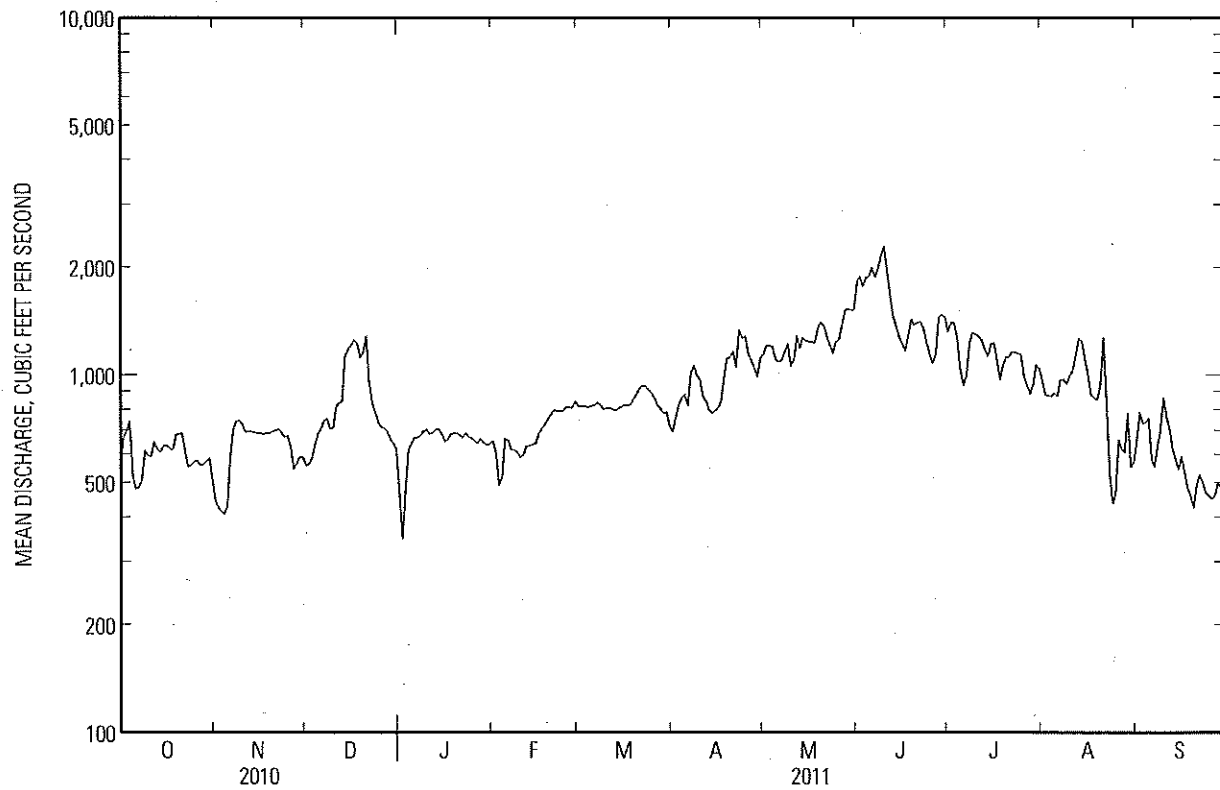
08313000 RIO GRANDE AT OTOWI BRIDGE, NEAR SAN ILDEFONSO, NM—Continued

SUMMARY STATISTICS

	Calendar Year 2010		Water Year 2011		Water Years 1971 - 2011	
Annual total	496,138		323,218			
Annual mean	1,359		886		^a 1,450	
Highest annual mean					2,764	
Lowest annual mean					602	
Highest daily mean	4,580	Apr 22	2,290	Jun 10	12,000	May 11, 1985
Lowest daily mean	407	Nov 4	348	Jan 2	195	Aug 4, 1977
Annual seven-day minimum	458	Oct 31	458	Oct 31	229	Sep 11, 1971
Maximum peak flow			2,930	Aug 21	24,400	May 23, 1920
Maximum peak stage			5.48	Aug 21	^b 14.50	Sep 29, 1904
Instantaneous low flow			287	Jan 2	195	Aug 4, 1977
Annual runoff (ac-ft)	984,100		641,100		1,050,000	
10 percent exceeds	3,570		1,290		3,340	
50 percent exceeds	936		802		961	
90 percent exceeds	594		554		498	

^a Average discharge for 71 years (water years 1895-1914, 1916, 1920-1970), 1530 ft³/s; 1,108,000 acre-ft/yr.

^b Present site and datum.



08313000 RIO GRANDE AT OTOWI BRIDGE, NEAR SAN ILDEFONSO, NM—Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1947 to current year.

PERIOD OF DAILY RECORD.--

SUSPENDED-SEDIMENT DISCHARGE: October 1947 to current year

INSTRUMENTATION.--Automatic pumping samplers for daily suspended-sediment samples from October 1993 to current.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SEDIMENT CONCENTRATION: Maximum daily mean, 65,000 mg/L, July 5, 2006; minimum daily mean, 11 mg/L, July 27, 1963 and Feb. 7, 1974.

SEDIMENT LOAD: Maximum daily, 386,000 tons, July 6, 1995; minimum daily, 3 tons, July 27, 1963.

EXTREMES FOR CURRENT YEAR.--

SEDIMENT CONCENTRATION: Maximum daily mean, 2,440 mg/L, Aug. 29; minimum daily mean, 35 mg/L, Nov. 3.

SEDIMENT LOAD: Maximum daily 5,370 tons, June 10; minimum daily, 60 tons, Feb. 3.

SUSPENDED-SEDIMENT
WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

Day	Mean concen- tration (mg/L)	Sediment discharge (tons/ day)	Mean concen- tration (mg/L)	Sediment discharge (tons/ day)	Mean concen- tration (mg/L)	Sediment discharge (tons/ day)	Mean concen- tration (mg/L)	Sediment discharge (tons/ day)	Mean concen- tration (mg/L)	Sediment discharge (tons/ day)	Mean concen- tration (mg/L)	Sediment discharge (tons/ day)
	October		November		December		January		February		March	
1	238	353	59	70	52	78	65	83	42	74	80	176
2	440	800	45	52	48	72	64	61	44	71	84	185
3	436	818	35	40	54	85	127	162	45	60	84	186
4	389	774	35	38	64	111	208	345	47	65	88	194
5	273	386	40	47	66	122	222	384	48	86	84	186
6	195	251	116	188	78	148	206	370	50	88	76	168
7	197	257	199	379	81	163	220	398	51	86	75	169
8	168	230	209	418	67	136	225	409	53	88	55	124
9	224	372	214	431	90	172	97	181	54	89	46	100
10	189	305	167	329	130	248	74	141	56	89	49	107
11	177	282	128	239	174	382	121	224	57	92	58	126
12	269	471	108	202	220	496	177	330	59	100	64	138
13	178	298	98	183	268	605	204	387	61	104	69	149
14	144	236	78	147	715	2,200	82	156	62	107	74	161
15	140	239	63	116	507	1,610	60	111	64	110	79	175
16	125	213	64	119	460	1,500	55	96	64	118	85	188
17	110	183	61	112	417	1,410	65	116	79	151	90	201
18	115	191	65	121	335	1,110	63	115	81	159	89	198
19	129	236	60	112	230	699	63	116	80	162	121	279
20	142	261	61	114	254	790	61	114	80	168	129	307
21	119	220	58	110	388	1,350	52	95	63	135	154	380
22	89	147	55	105	234	610	54	98	50	107	160	404
23	69	104	55	103	117	264	57	106	48	104	134	337
24	64	96	59	106	89	190	53	96	54	116	127	310
25	64	99	56	101	73	145	47	84	114	253	119	286
26	65	101	51	86	65	126	46	82	89	195	106	247
27	65	99	44	65	60	116	51	88	76	166	108	241
28	66	99	46	71	83	154	37	66	71	160	97	210
29	66	101	46	74	64	114	37	65	---	---	76	159
30	66	104	54	85	62	108	39	67	---	---	86	183
31	67	91	---	---	66	110	40	70	---	---	90	176
Total	---	8,417	---	4,363	---	15,424	---	5,216	---	3,303	---	6,450

08313000 RIO GRANDE AT OTOWI BRIDGE, NEAR SAN ILDEFONSO, NM—Continued

SUSPENDED-SEDIMENT
WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

Day	Mean concentration (mg/L)	Sediment discharge (tons/ day)	Mean concentration (mg/L)	Sediment discharge (tons/ day)	Mean concentration (mg/L)	Sediment discharge (tons/ day)	Mean concentration (mg/L)	Sediment discharge (tons/ day)	Mean concentration (mg/L)	Sediment discharge (tons/ day)	Mean concentration (mg/L)	Sediment discharge (tons/ day)
	April		May		June		July		August		September	
1	84	158	263	808	738	3,630	131	465	895	2,390	831	1,470
2	122	247	283	923	532	2,700	253	1,060	308	736	1,820	3,910
3	140	311	275	895	386	1,850	542	2,050	212	504	1,060	2,100
4	123	286	281	914	434	2,190	279	950	203	479	590	1,180
5	145	344	201	593	453	2,320	141	397	397	950	1,340	2,710
6	181	404	184	542	559	3,000	103	260	642	1,520	843	1,330
7	325	907	231	688	402	2,040	122	328	456	1,190	448	671
8	278	798	369	1,160	551	2,950	198	657	291	765	651	1,110
9	195	525	412	1,360	694	4,060	185	657	236	601	994	1,890
10	152	399	243	698	868	5,370	140	492	263	709	2,160	5,050
11	110	259	221	655	588	3,120	108	376	259	720	1,160	2,440
12	90	206	256	881	363	1,650	117	395	311	959	522	992
13	79	172	211	679	257	1,010	103	327	414	1,450	350	588
14	82	172	251	863	239	887	105	320	580	1,940	291	455
15	80	171	212	716	227	779	156	513	459	1,370	265	390
16	83	182	225	754	211	692	150	499	378	1,010	423	677
17	117	269	227	762	253	802	127	384	320	759	377	548
18	379	1,030	171	565	259	897	104	272	319	743	254	330
19	827	2,500	251	918	280	1,080	106	302	328	758	172	213
20	604	1,820	272	1,030	275	1,020	153	466	338	860	153	175
21	663	2,090	241	889	259	979	149	451	749	3,270	222	295
22	541	1,530	167	576	244	928	357	1,120	861	2,020	221	314
23	844	3,050	139	454	228	825	192	604	474	678	160	216
24	438	1,510	126	393	212	705	165	510	306	361	128	161
25	255	877	145	486	197	606	483	1,490	416	542	118	147
26	346	1,070	164	554	181	530	209	571	981	1,760	122	148
27	229	682	340	1,260	197	609	155	389	866	1,450	130	162
28	206	578	404	1,650	215	837	330	790	866	1,460	159	216
29	224	599	371	1,530	153	606	482	1,270	2,440	5,200	152	198
30	243	737	285	1,170	148	577	1,350	3,950	1,460	2,220	100	124
31	---	---	336	1,380	---	---	753	2,140	1,270	1,940	---	---
Total	---	23,883	---	26,746	---	49,249	---	24,455	---	41,314	---	30,210

Total suspended sediment discharge (tons)	
Year	239,030